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ADS FOR INDIA

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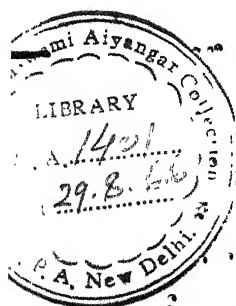
“All social progress resolves itself into the making of good roads ”

Ruskin

TATA STUDIES IN CURRENT AFFAIRS

ROADS FOR INDIA

by
T. R. S. KYNNEERSLEY,



Illustrations by
A. R. ACOTT

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FOREWORD

The first of the series of Tata Studies in Current Affairs dealt with India's most vital problem, Food. Growing food, however, is only the beginning of the ~~process~~ of feeding people, for it has to be taken all the way from the farm through the market to the consumer, and that demands an efficient road system. The villager, too, needs adequate means of communication with the outside world for the satisfaction of his simple needs and for the provision of some of the amenities associated with civilization. Agriculture thus largely depends for its prosperity on satisfactory transport facilities being available, and this booklet deals with what is in many ways, from the point of view of the agriculturist, the most important of the forms of transport. Seventy-five per cent of our population lives in villages and on their well being, depends the strength of the whole country.

India is very badly served in the matter of roads, and this inadequacy was painfully brought to light during the recent Bengal famine. The lack of an efficient network of roads, particularly in rural areas, over which wheeled transport could bring speedy relief, proved a serious handicap to the transfer of crops from surplus areas to places where drought and famine had brought calamity.

Mr. T. R. S. Kynnersley, the author of this book, is a well known figure in the engineering world of India. He has served the cause of roads, more roads and better roads in this country for many years. He is a past President of the Institution of Engineers and President of the Indian Roads & Transport Development Association.

At the end of the booklet is appended a map of India featuring our existing road system and the new arterial and feeder roads proposed by the Chief Engineers at the Nagpur Conference in 1943. The map will serve to emphasise the magnitude of the problem and the urgency of placing it in the forefront of the national planning which is to create a happier and ampler life for the people of this country.

H. P. MODY.

January 2, 1946.

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CHAPTER I

WHAT IS A ROAD ?

We all know what a road is or think we do, but have we ever stopped to consider the full meaning of a road and the bearing it has on our everyday life ? In this series you have already read about our food and if you were asked what are the most essential things in a man's life you would probably say food, clothing and housing. The air you breathe is also essential, of course, but it is free. We don't bother about it very much in the same way that we don't bother about roads because they are free, or at least they appear to be. In actual practice we all pay a great deal for the benefit of having roads, but as we pay indirectly we don't seem to notice it.

In the earliest days of man's life on this earth, ~~he~~ probably did not know or care what a road was. He must have spent a considerable part of his time



in avoiding being attacked or eaten up by large monsters from which he had to escape by the only means known to him along some jungle path or over a river, by means perhaps of a fallen tree or some such primitive bridge. From his cave, where he and his family lived, he had some hunting or fishing ground to which he used to make successive trips and he probably wore away the grass along a definite track. This, today, we call a path. For thousands of years the inhabited parts of the earth were probably covered by nothing more elaborate than pathways made by men and animals, for in the same way as man makes a path so do animals—hence the terms “sheep track” or “goat track.”

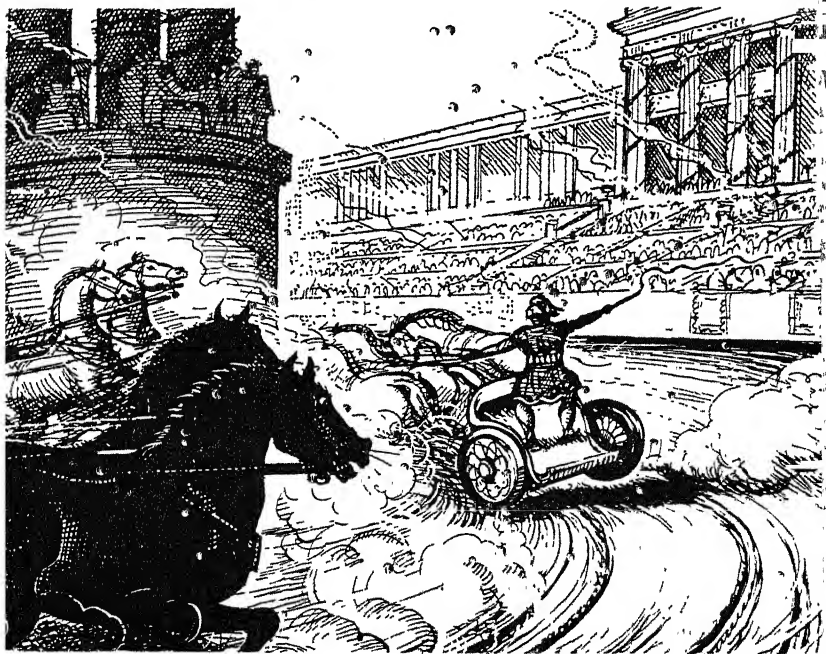


The next stage in the evolution of the road was probably brought about by man's inventive mind thinking out a roller which eventually turned into a wheel by which he found that he could move his agricultural produce or the bodies of the animals he slew back to his cave and his family.

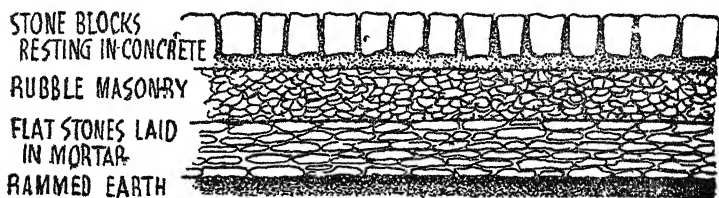
We have all heard of the Roman Chariot. The Romans used to have races in these machines as exciting as the motor races we have today and in some of the old

buried cities in Italy the ruts worn by these Roman chariots can be seen worn into the solid stone which paved the streets of Pompeii and Herculaneum, cities submerged over nineteen centuries ago by the ashes of the volcano Vesuvius. In those days men fought from chariots, and the archers with their bows and arrows went forth to battle on wheels just as troops do today.

The Romans are famous as road makers, and many of their roads are in existence today, one of the best known being the Appian Way, construction of which was commenced in 312 B.C. The pictures on pages 4 and 9 give some idea of how they used to make their roads and, as the matter is of great interest even today, a description of their methods is given herewith.



Two parallel trenches marked the breadth of the road. Loose earth was removed until a solid foundation was reached and it was replaced by proper material, consolidated by ramming or other means to form a solid foundation for the body of the road. This was composed generally of four layers.



The lowest layer consisted of two or three courses of flat stone or other stones generally laid in mortar. The second layer was composed of rubble masonry of smaller stones or a coarse concrete. A pavement consisting of two layers of polygonal blocks of hard stone was then laid, the top layer being then jointed with "the greatest nicety." The four layers were often as much as 3'-0" thick or more, the two lowest ones being dispensed with if the road was laid on rock. The paved part was 16'-0" broad. On either side, and separated from it by raised stone causeways, there were unpaved sidewalks, each of half the width of the paved road.

While the Romans are credited with so much in the development of roads, it is believed by certain antiquarians, among them Seamus Mac Call, that the Celts in Gaul and in parts of Britain and Ireland made roads long before the Roman conquest. The Celts put the shirts on Roman backs, gave them their coulters

ploughs, most of their dyes, their beds with mattresses, and their beer. They taught them to cure meat, make white bread and a variety of cheese, so it is not surprising that they also developed communications.

Ireland, which fortunately escaped the Roman "blight," shows evidence regarding the art and technique of road making among the Celts.

There is said to be a timber roadway still in existence, a considerable distance below the original surface of an Irish bog. According to rough calculations, it was built 3,250 years ago and the surface, which was 7 feet wide, was made from split slabs of oak laid across longitudinal beams.

There is existing evidence in connection with some of the ancient roads made in Ireland that these were stone-paved rather like the Roman roads and were cleaned and kept in repair according to Law. There is also one surviving fragment which suggests that the ancient Irish had anticipated the Mac Adam type of road.

To give some idea of the difficulty of road travel two and a half centuries ago in England, the following extract is taken from a contemporary letter describing Prince George of Denmark's journey from Windsor to Petworth to meet Archduke Charles of Spain on his way from Portsmouth to visit Queen Anne in 1703:—

"We set out by Torch Light, and did not get out of the Coaches, (save only when we were overturn'd or stuck fast in the mire) till we arrived at our Journey's end. 'Twas hard service to sit



- 14 hours in the coach that day without eating anything and passing through the worst ways that ever I saw in my Life: we were thrown but once indeed in going, but would have suffer'd very often, if the nimble Boors of Sussex had not frequently poised it (the coach) with their shoulders from Godalmin almost to Petworth. The last 9 miles of the way cost us six hours time to conquer 'em'.

Now coming to India, the following extracts from the Report of the Indian Road Development Committee may be of interest :

“ According to the latest discoveries of the Archaeological Department, excavations at Mohenjodaro and Harappa in the Punjab show that in these cities some 3500 and 2500 years B.C. there were broad streets with proper drainage systems and it is recorded that Chandra Gupta's Prime Minister made rules regulating widths of roads in about

900 B.C., also types of roads for various purposes and kinds of traffic and prescribed punishments for obstructing roads. This was about 322 B.C. In those days, chariot roads and Royal roads leading to the country were about 24 feet in breadth. Roads to military stations and villages were about 48 feet broad, while roads for chariots only were about $7\frac{1}{2}$ feet broad, and pathways meant for human beings and minor quadrupeds were only 3 feet broad. Some specifications have been found which describe the road surface as being like the back of a tortoise. During the reign of Chandra Gupta, pillars serving as mile-stones and sign-posts were set up at about 2000-yard intervals.

"In the Pathan and Mogul reigns, the main road service of the country received considerable attention and many of the roads laid by Mogul Emperors still exist. It is recorded that Emperor

Sher Shah, who reigned from 1540 to 1545, made a 'Sarai' or resting-place for poor travellers at intervals of about 4 miles. Round these "Sarais" villages were gradually established. Some of the original roads were along the lines of the grand trunk roads of today, namely Patna to Delhi, and Delhi to Lahore.



SHER SHAH

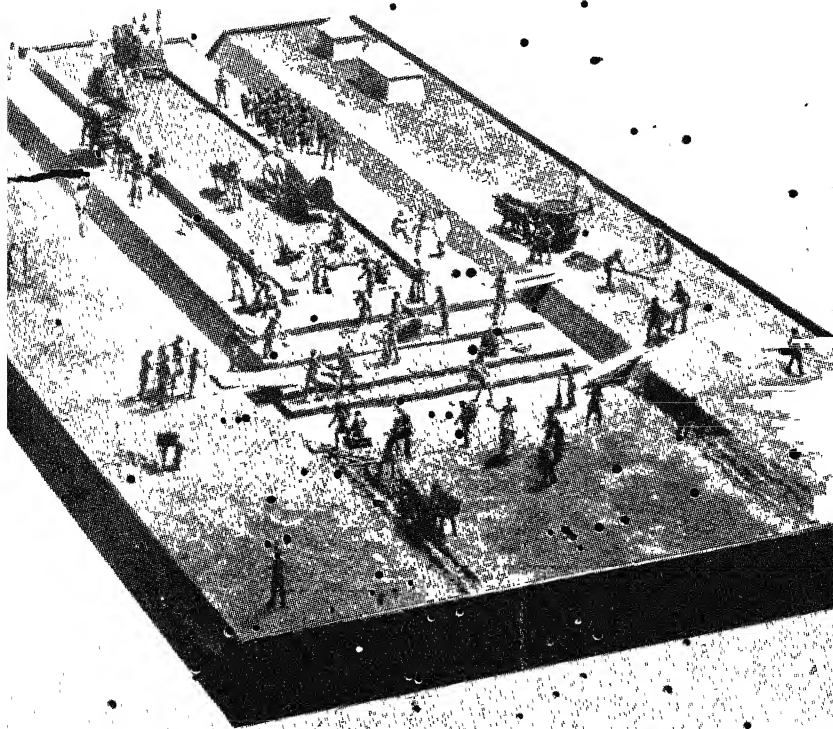
There were also the roads made in the times of the Moguls between Agra and Allahabad and from Bijapur to Ujjain. How much or how little free movement of commerce existed along these roads is difficult to estimate,

but the surfaces were very rough and easily cut up in bad weather.

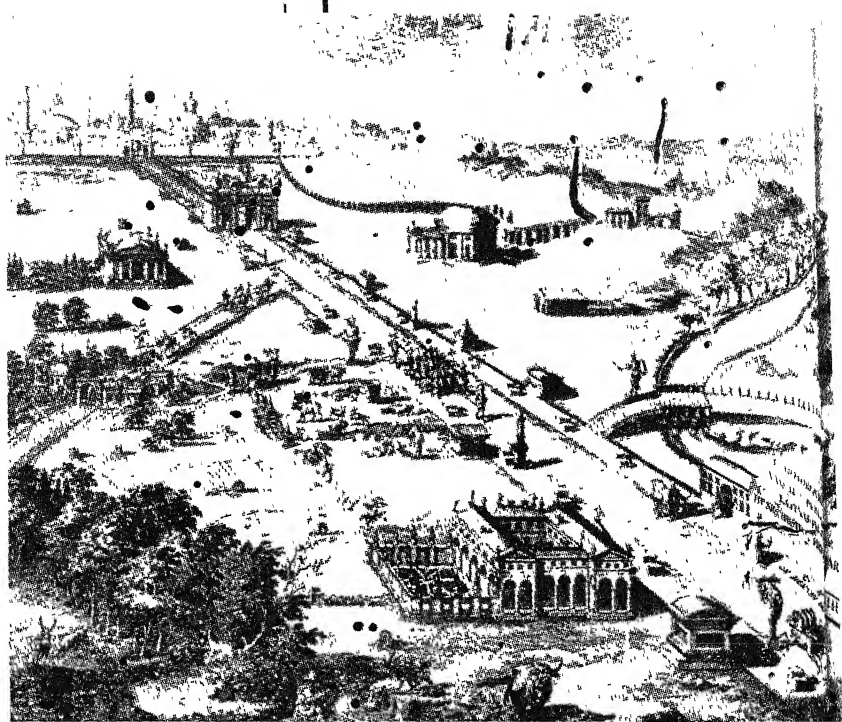
“Prior to the introduction of railways in India, a number of trunk roads were installed and built under the supervision of military engineers. These connected up the more important military and commercial centres. These military engineers finally handed the work over to the department of Public Works, now commonly known as the P.W.D.”

History of Road Building:

We include in these four pages photographs depicting the History of Road Building in different countries showing the various methods of Road Construction and implements used.



View of the "VIA APPIA", the principal ancient Roman Highway. Construction begun by Appius Claudius Caecus, Censor of Rome, 312 B. C.



A Typical Military Highway leading from ancient Rome.

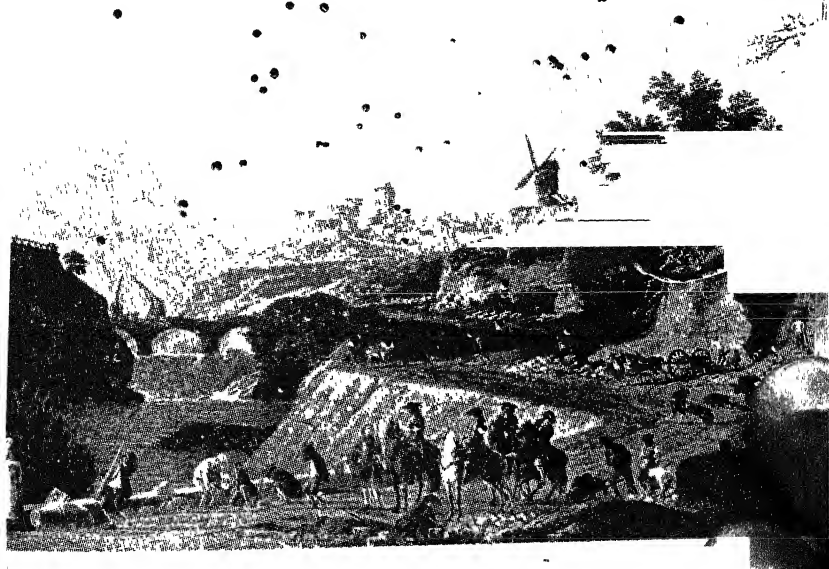


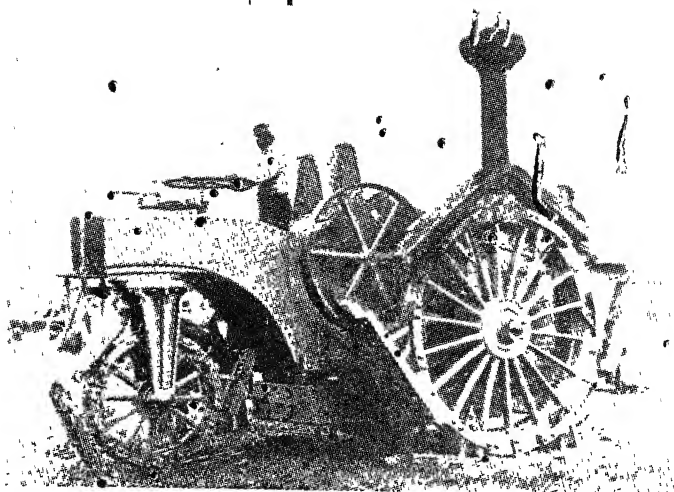
Implements in use by ancient Romans for road construction.

Constructing a Highway in France the 18th Century.

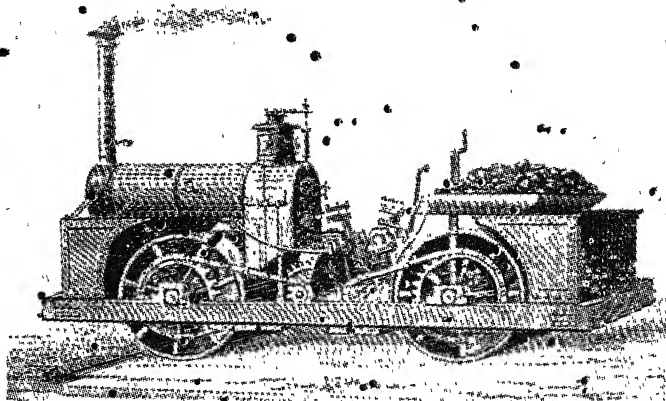
(Photographs reproduced by courtesy of M/s. Three Lions, New York).

Road Building
in the Caucasus,
Russia,
1880.





- Steam-Tractor Built and Photographed in 1857. This picture of the fore-runner of all automotive road-building equipment is the oldest extant photograph of any self propelling vehicle.



Macadamizing Machine, 1869.

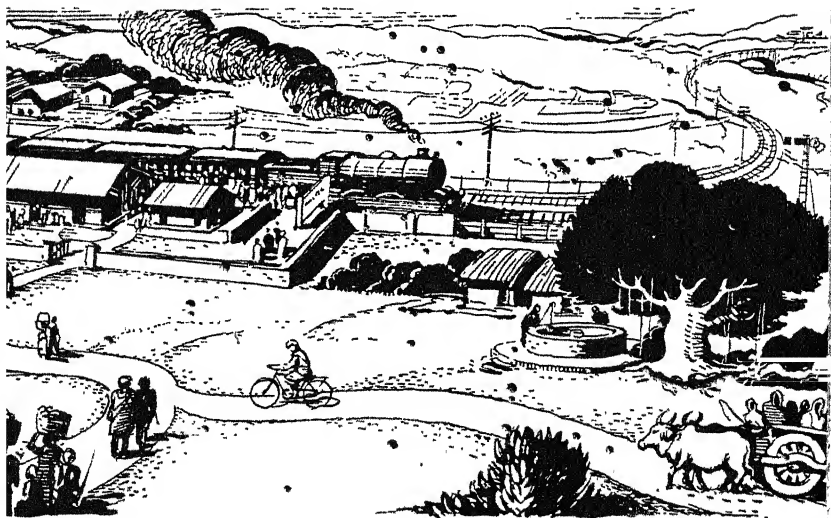


Road making in England in 18th Century.

CHAPTER II

WHY DO WE NEED ROADS ?

Here again the answer might appear to be to some people very obvious. On the other hand, if you look round India, you will come to the conclusion that it is certainly not obvious to everybody, as there are thousands of square miles in this country where no roads exist at all ! So we must get back to the heading of the chapter "Why do we need roads?" If you go by train you may argue that you don't need a road, but a train needs a road of its very own and then it only picks you up at one station and drops you at another. To and from this station you have to go, either on foot or on a horse or any sort of wheeled vehicle such as bicycle, tonga, ekka, motor bus or motor car.



6-1

Have you ever tried cycling across a field? If so, you would naturally have chosen a pathway which had already been beaten down by somebody else, and if you met another cyclist, one of you would have to get off the narrow path. Perhaps you have ridden a bicycle along a bad dusty road or you may have worn out several pairs of shoes or sandals walking along rough country roads.

This has been merely to get yourself from place to place but, when you wish to move your garden produce, materials for building or merchandise of any sort, you instinctively turn to something on wheels.

It is admitted that in many hilly countries men and women still carry things on their backs but even they are beginning to learn that it is a waste of effort to avoid using the wheeled cart, and up in the Himalayan foothills, today you will find, even on the most jungly tracks, men pushing great logs of timber on trollies fitted with small wheels. They are beginning to learn the value of a road.



Let us turn our attention for a moment to city life. How would you like to put up with country roads in your city? They would surely be filled with dust which would in turn bring disease and trouble. It would take every vehicle very much longer to get about, the wheels would be rapidly worn out and we should very soon find the necessity for better roads. Better roads bring better vehicles, better vehicles need better roads, and so, we go on until we find in the most advanced countries in the world roads like billiard tables going over hills and dales for thousands of miles, connecting



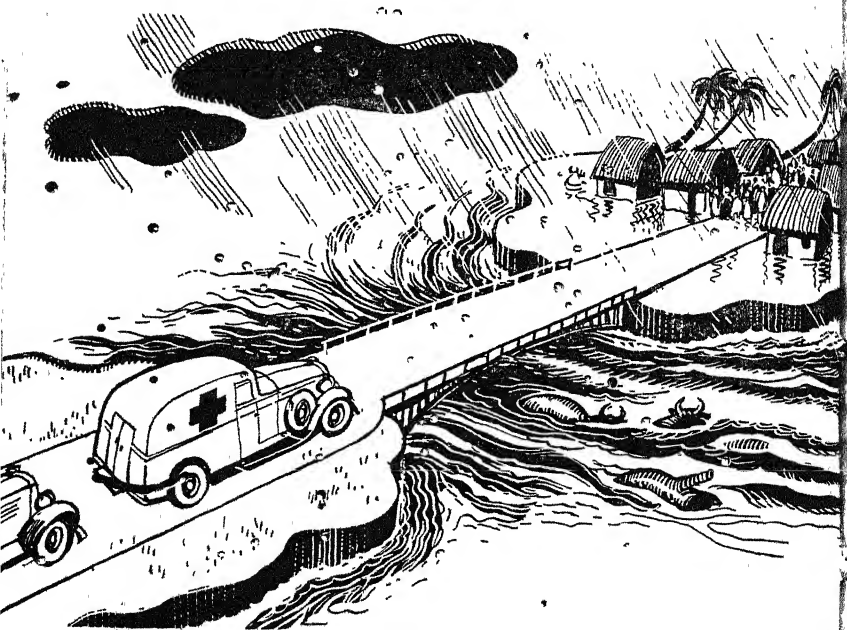
up not only the towns but the smallest villages and thus bringing education, health, wealth and happiness to the countryside.

Here are some of the ways in which roads promote national wealth and prosperity.

Roads directly assist the control of soil erosion which is laying waste large areas of the country. New roads, in addition to improving agriculture and afforestation, themselves serve to restrict the flow of water at bridges and culverts.

The development of trade and commerce depends largely on better roads. Good roads contribute to the mental and moral advancement of the people by the extension of educational facilities, the opening of schools, better interchange of information through improved postal systems and the extension of travelling cinemas and libraries to the villages.

Roads promote the extension of medical services—the lack of which levies a heavy toll on human lives—and the prevention and relief of epidemics, as also the extension of veterinary services.



Yet other advantages of a sound road system are the prompt transport of people and commodities during unforeseen national calamities ; the development of inter-community life, spirit and tolerance ; the development of village uplift, social welfare and co-operative societies ; and the improvement in the standard of living through increased national production and consumption.

Feeder roads which, as their name implies, feed arterial roads, railways and river stations, are of the greatest value in taking people and merchandise to and from the country districts and so add immeasurably to the usefulness of the main arteries.

CHAPTER III

DON'T WE NEED A BRIDGE OR TWO ?

Nearly every country in the world is intersected by rivers. Sometimes these rivers flow all the year round and sometimes they overflow in the wet season but, when they are running full, they create an obstacle to any passage across them. From time immemorial, men crossed rivers through the shallow places in waist-deep water by what are known as fords and then again boulders were put in at intervals across the stream and these were known as stepping stones. Probably the next bridge to be evolved was what we know today as the



WADING



STEPPING STONES



CAUSEWAYS

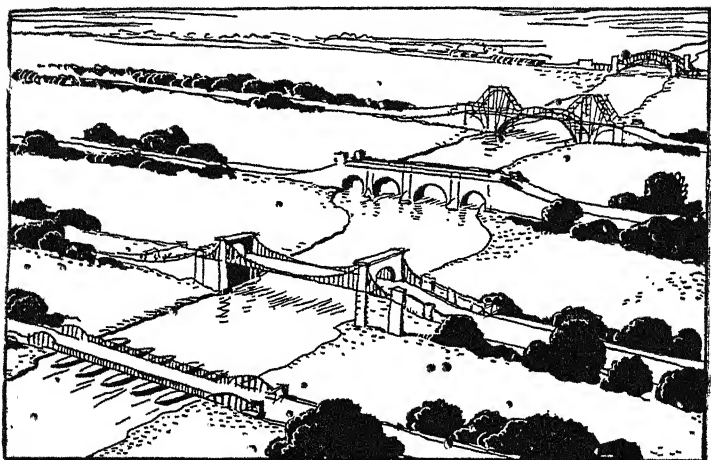


BOATS



BRIDGES

causeway which, in the old days, was nothing more than rocks and boulders thrown across the river. The water found its way through the rocks, and men and women could walk across with comparative safety. Then again, when the rivers were deep, men crossed them in boats



TYPES OF MODERN BRIDGES

or pontoons or floating bridges, and sometimes by crude suspension bridges made with jungle fibres.

There are many floating bridges today which are most successful. The next cheapest type of bridge is probably the suspension type where two steel cables are slung from side to side of the river and support a pathway or road by means of vertical ties slung from the main ropes. By this means, broad and swift flowing rivers are crossed with a minimum amount of trouble and expense. There are today many magnificent examples of suspension bridges, the biggest being the Golden Gate in San Francisco. Many of the oldest bridges of history were built as a series of arches made of stone

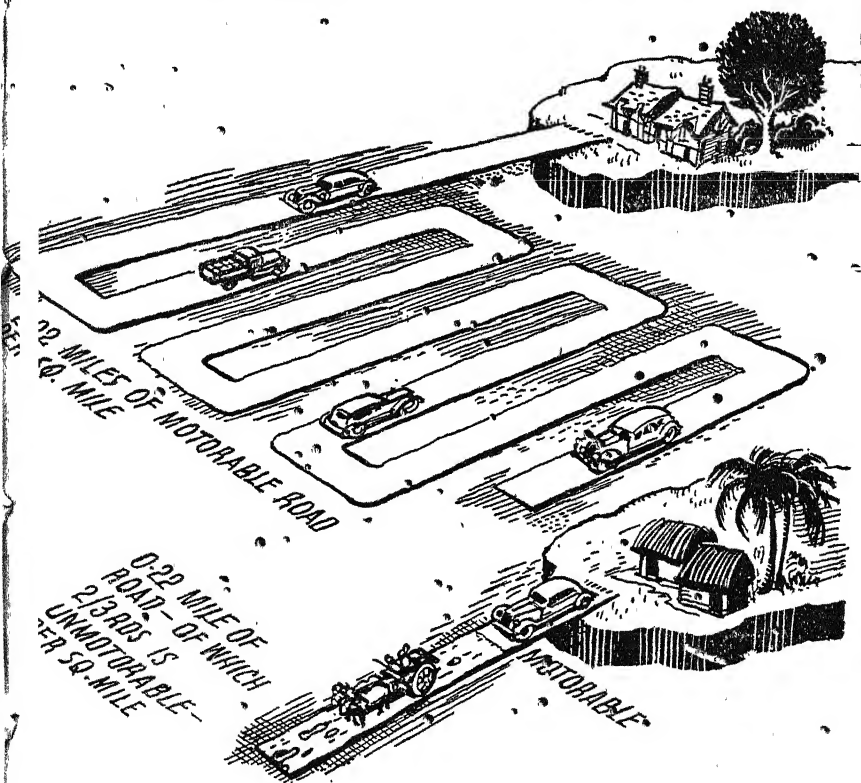
cut by masons to fit so well that the bridge proved strong enough to resist the worst floods. Then came the modern materials, viz. steel and concrete, which helped to make the magnificent bridges that the world possesses today.

So you see that the bridge is really a part of the road, for without a bridge there are many parts of the country in which the roads are no good.

CHAPTER IV.

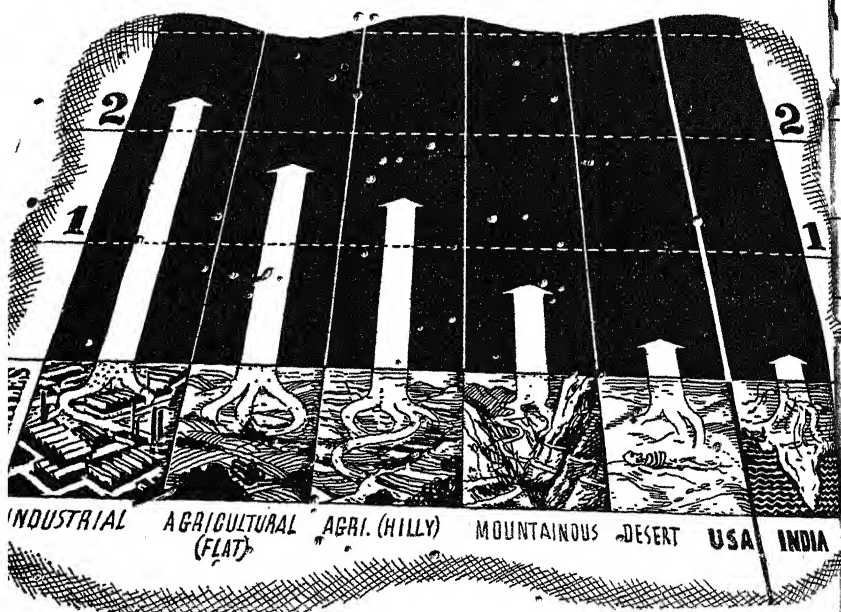
HAS INDIA ENOUGH ROADS?

The answer is No. Very definitely No ! In Great Britain, there are 2.02 miles of roads per square mile, while India has only 0.22 of a mile or about one-tenth, and of this one-tenth only about one-third is fit for

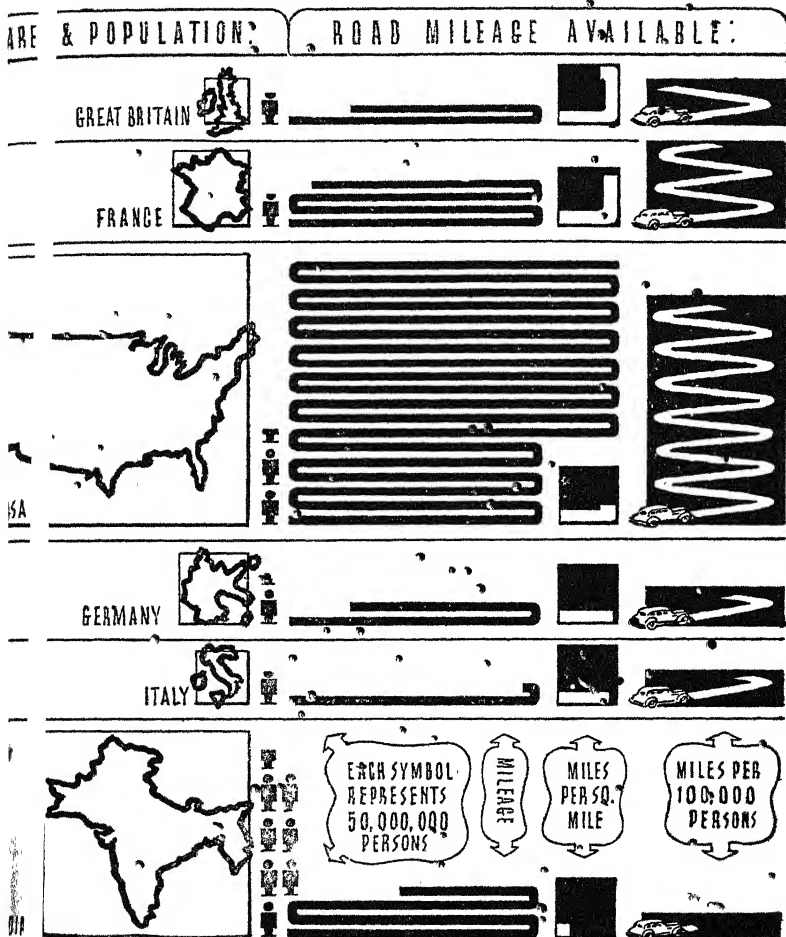


motor vehicles. Motor vehicles include buses, lorries, motor cars and everything that travels under its own power. So you see Britain really has about 30 times more roads per square mile of country than we have in India. One of the greatest authorities on highway construction in America, Mr. E. W. James, has given the miles of highway per square mile of area for the following types of country as follows :—

Type of Country	Miles of highway per square mile
Highly developed manufacturing areas	... 2.3
Highly developed flat agricultural areas	... 1.7
Well developed hilly agricultural areas	... 1.4
Mountainous areas	... 0.7
Desert Areas	... 0.3



Therefore, according to a recognised standard, India has a lesser mileage of roads than is expected in a desert in America !



On the next page are given some interesting figures showing how badly off this country is in the matter of roads compared with other countries.

ROAD MILEAGES IN VARIOUS COUNTRIES IN RELATION TO AREA AND POPULATION

Country	Area in Sq. Miles	Popula- tion	Road Mileage	Road Mileage to the Sq. Mile	Road Mileage per 100,000 of popu- lation
Great Britain	88,748	45,601,000	178,904	2.02	392
France	212,741	42,010,000	392,147	1.84	934
U.S.A.	2,973,776	122,775,046	3,068,921	1.03	2,500
Germany	181,814	66,616,000	173,287	0.95	260
Italy	119,722	43,050,000	106,129	0.89	247
India	1,575,227	388,852,000	347,132	0.22	89

Remarks :—Roads in all the above countries, except India, are motorable. In India, cart tracks and bridle paths (a large proportion of which—76,200 miles—has been omitted from the latest Government figures) account for 31% of this mileage and fair weather roads for 35%. Thus the proportion of serviceable roads in India throughout the year is no more than 34% of the total mileage.

CHAPTER V.

IF NOT, WHY NOT ?

To answer this question, we have to go right back into history. For many hundreds of years, India has been a land of the peasant farmer. Wars have been fought over the country from prehistoric times but, in the old days, armies moved, mainly on horses and elephants or on foot. There were few wheeled vehicles and roads played an insignificant part in the general life of the country, as there was little demand for them. An elephant, camel or horse can very well go across country, even men marching (though they might prefer a hard road) can also go across country, especially when they are fighting and have to keep under cover.

The advent of railways reduced the importance of roads in the eyes of the government of the day and it was only the extraordinary progress of the petrol engine and motor car that started the world thinking about roads again. After the upheaval of 1857, the Royal Engineers in India built some very fine roads. These roads mainly took the same lines as those built by Akbar 300 years before.

The usual reason given for not having enough roads is shortage of cash. This is a common cause of insufficiency of a lot of things. Another good reason is lack of public opinion. Public opinion is a curious thing, it can usually be led but never driven, not at any rate outside Dictator countries. Public opinion is a fickle thing and, unless properly educated and directed, is not as a rule constructive. It is much easier to pick holes in things than to build afresh. So the combination

of so-called want of funds and lack of public demand has been the main cause of the shortage of roads.

As petrol driven motor cars became cheaper, more and more people found their way on to the roads of India and the more they came the more they complained. Automobile Associations were started to help motorists and to get better roads. Several other Associations were formed in India, the most influential of these being the Indian Roads and Transport Development Association, with its headquarters in Bombay and branches all over the country. Finally, the semi-official body known as the Indian Roads Congress came into being. It consists mainly of the Senior Engineers of the various Provinces and States and carries considerable weight.

Roads are not however meant for rich men alone, and the great improvement in the types and number of buses plying on the roads of the country is proof that the masses of the people are just as anxious to go by road as anyone else. One great advantage of the bus is that it picks you up near where you live and takes you almost where you want to go. Fares are generally speaking low, though comfort is somewhat lacking. In America and in many countries of the West, there are magnificent buses for the public which take people thousands of miles in perfect comfort. You can sleep on board, and at convenient intervals there are beautiful wayside hotels, complete with everything the traveller needs.

The transport of merchandize by road over reasonable distances is also very convenient as goods are taken straight from the factory in one city to a godown in another. Agricultural produce from the fields can, in the same way, be taken straight to market. There is no transshipment and no waste of time.

CHAPTER VI.

WHAT KINDS DO WE NEED ?

Before we can choose, we must consider what kinds are available. The cheapest form of road is plain beaten down earth ; but to make this type successful, the composition of the earth must be more or less suitable or some natural binding material such as clay or *kanker* lime must be added. Molasses from sugar factories have been used but are only satisfactory in dry weather.

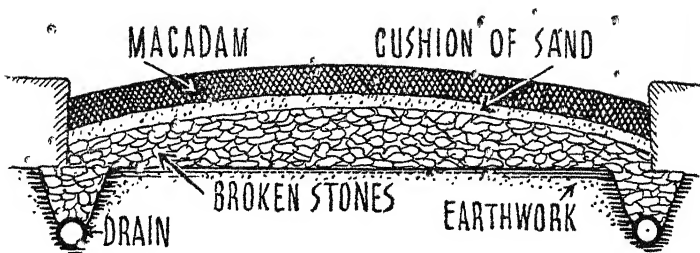
The next type of road requires a certain amount of engineering and is built on the principle known as "soil stabilization" and consists, in the main, of, mixing the existing soil with other materials like oil or cement so that the final mixture is more or less stable.

The next, and possibly the best known, type of road is the water bound macadam, which is named after Mac Adam, who with Telford evolved new and, until then, untried methods at the beginning of the 19th century. Both these engineers insisted on thorough drainage, and on the use of carefully prepared materials. They adopted a uniform cross section of moderate curvature, and while



J. L. MAC ADAM

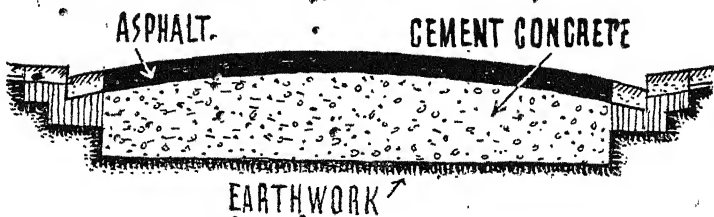
Telford paid particular attention to a foundation for the broken stone, Mac Adam disregarded it,

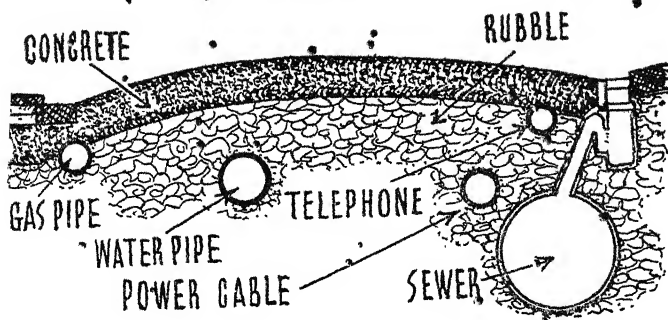


contending that the subsoil, however bad, would carry any weight if made dry by drainage and kept dry by an impervious covering.

From these early beginnings we have today the well-known water bound macadam road, which consists of small pieces of stone held together with a mixture of water and sand or grit and rolled with a steam roller, causing the various pieces of stone to fit together. The resulting road is fairly satisfactory for pneumatic tyred vehicles or bullock carts, but not for the combination of the two.

Unfortunately, pneumatic tyres in India are the exception rather than the rule and the iron tyre of the bullock cart, coupled with the sucking action of pneumatic tyres, destroys water bound macadam in a very short time. The next stage is to bind the stones together with an elastic medium like tar or bitumen. Natural bitumen is dug out of lakes in Trinidad and other parts of the West Indies, but other bituminous oils and by-products from crude oil (which comes out of the ground) are available in India. In addition, certain kinds of tar make an excellent binder.





Going further up the scale, we come to cement which, when made into a paste with sand and water, serves as glue to stick the stones together. This is known as concrete road construction which has proved of great value when the traffic is heavy enough to warrant the initial expense.

Finally, we have roads made of solid stone usually in the form of setts or small cubes laid in a bed of mortar. These stone sett roads are very strong and lasting. They are also very noisy and very expensive to build. There are certain places in big cities where cast iron plates are used, but these are exceptional and only used for intensive traffic.

This must appear to be a sufficiently imposing list to bewilder the reader and provoke the question: On what basis is a particular material chosen for a road? The answer to this one would take several volumes of closely printed matter and, in a little pamphlet of this size, we cannot go into details but, in passing, it is as well to remember that the cost of a road is the cost to the public over thirty or forty years and, like a lot of other things in the world, the cheapest in the beginning is not necessarily the cheapest in the end. Then there is the ever-recurring cost and bother of

maintenance. In other words, when the surface of a road wears into ruts and potholes, somebody must come along and mend it. Unfortunately, it is only too common knowledge that there is an invariable time lag or delay between the road wearing out and somebody doing repairs. This must be changed and, if only road engineers had their way, it would be changed. Unfortunately, the King's Highway is common property and there are many fingers in the pie and while engineers do their best they cannot, like the Israelites of old, make bricks without straw or, to put it more directly, they cannot build proper roads without sufficient money.

CHAPTER VII.

HOW MANY MORE DO WE WANT ?

In December 1943, there was held in Nagpur an important conference of Chief Engineers of Provinces and States who subsequently issued a Report on "Post-War Road Development in India." In that booklet will be seen some of the answers to the question which heads this chapter.

From the accompanying diagrams an idea will be gained of the existing state of affairs in the various Provinces, both with regard to the National Provincial Highways and major roads and also smaller district and village roads. It is calculated that 400,000 miles is the estimated requirement for the whole of India in the next twenty years. The total lengths and costs were estimated thus :—

	miles	Crores Rs.
National Highways	22,000	47
National Trails	3,000	3
Provincial Highways	65,000	121
District Roads—Major	60,000	62
District Roads—Others	100,000	80
Village Roads	150,000	30
Arrears of war years	...	10
Bridging	...	45
Land acquisition	...	50
Total :	400,000	450 (approx)

The above costs have been arrived at on the basis of a 50 per cent increase over pre-war figures.

In the diagrams are shown the existing mileage of surfaced roads, but many of these will have to have

MILES

5000

10000

15000

20000

25000

N.W.F.P.

PUNJAB

U.P.

SIND

ASSAM

ORISSA

BIHAR

BENGAL

BOMBAY

MADRAS

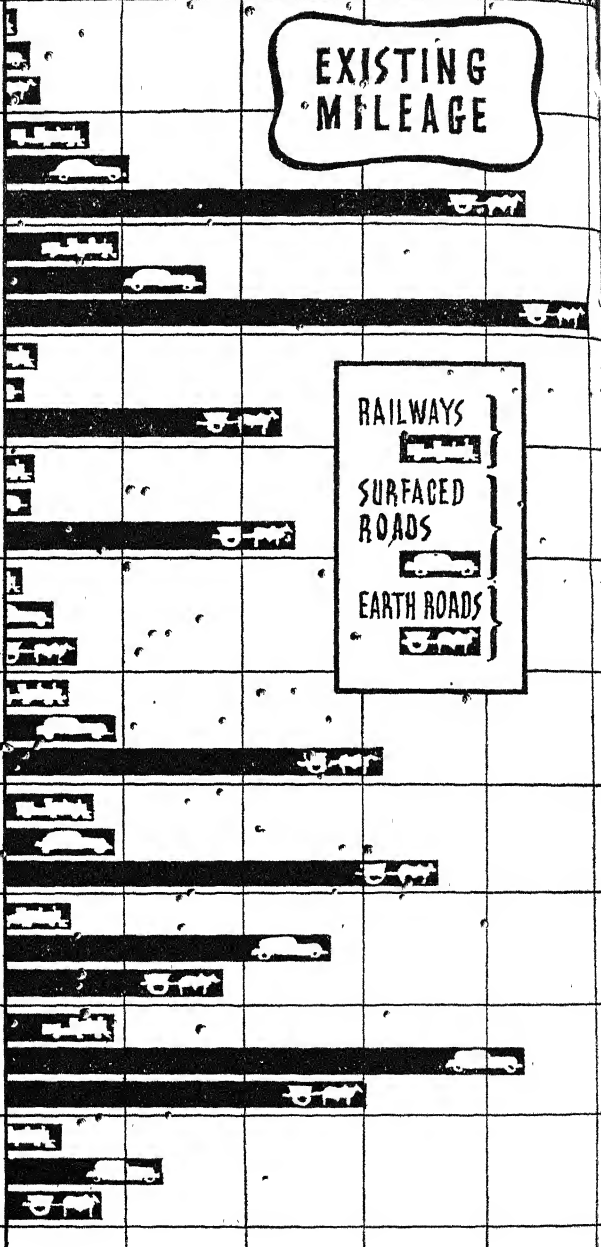
C.P.

EXISTING
MILEAGE

RAILWAYS

SURFACED
ROADS

EARTH ROADS



INDIA'S POST-WAR ROADS

AS VISUALISED BY THE
CHIEF ENGINEERS IN
THEIR NAGPUR REPORT

NATIONAL HIGHWAYS & TRAILS

PROVINCIAL HIGHWAYS

DISTRICT ROADS - MAJOR

DISTRICT ROADS - OTHERS

VILLAGE ROADS

ARREARS OF WAR YEARS
BRIDGING

LAND ACQUISITION

TOTAL COSTS

450
CRORES

121

62

80

30

10

45

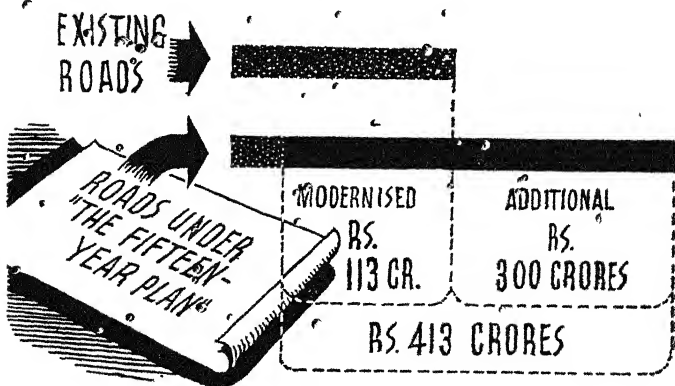
50

considerable sums spent on them before they come up to the desired standard.

As already stated, these estimates were made nearly 2 years ago and since then special officers have been appointed in practically all Provinces and States to deal with road development, and they in turn have produced their own estimates for their Provinces and States. These, in most cases, are very much in excess of the estimates made by the Chief Engineers in conference.

There is an old saying that you must cut your coat according to your cloth, which means you can only get what you can afford to pay for. This brings us to the consideration of the financial aspects of roads, dealt with in subsequent chapters.

According to "A Plan of Economic Development for India" popularly known as "The Fifteen-Year Plan," the length of existing roads in British India is in the neighbourhood of 300,000 miles. Of these, 74,000 miles are metalled and 226,000 miles are unmetalled. The programme of doubling the entire mileage



is intended to cover mainly village roads and the humbler district roads. The idea of the authors of the Plan is that all the bigger villages should be connected with the main highways of trade, so that no village with a population of 1,000 and over should be more than, say, a mile or half a mile from a public road. They go on to say that side by side with this road development, the bullock cart, which is bound to remain the principal means of vehicular traffic in rural areas, should be improved, especially by the use of pneumatic tyres, as this would go a long way towards reducing road maintenance costs. They estimate that the cost of constructing a further 300,000 miles of roads in India would amount to Rs. 300 crores, while modernising 226,000 miles of ordinary earth roads, which are at present being used for vehicular traffic, would cost another Rs. 113 crores.

CHAPTER VIII.

DO ROADS PAY FOR THEMSELVES ?

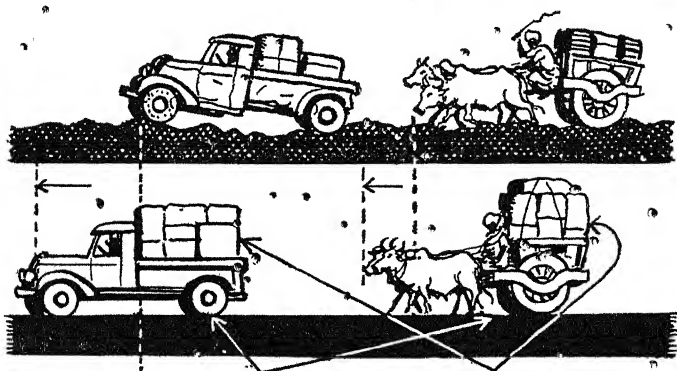
At the request of the Government of India, the Indian Roads and Transport Development Association made pilot surveys in the Province of Bombay in the year 1943 with a view to getting evidence regarding the financial aspects of roads. It is generally recognised that, before a Government Department puts its hand in its pocket for money, evidence must be produced that the scheme is going to pay in hard cash.

In the case of hydro-electric schemes, irrigation schemes, dams and railway extensions, it is comparatively easy to convince the financial pundits if facts and figures are produced to show that a scheme is likely to pay. In the case of roads, however, no one seems to have been able to produce sufficient facts to convince the hard-headed financial departments of the various governments in this country that roads pay for themselves, although every individual who studies the matter at all knows perfectly well that they do. The pilot surveys already referred to were largely undertaken for this purpose. They set out to obtain an evaluation of the economic benefits conferred by an adequate system of rural roads and their relation to the cost of construction and maintenance of such roads.

Two areas in Bombay Presidency with different characteristics—one wet and the other dry—were chosen for the survey and the investigations showed that, as a result of the facilities afforded by more and better roads, not only could further land be put under

cultivation and better prices ensured to the agriculturist, but far-reaching changes could be expected in the type of agriculture.

For instance, the extension of vegetable, fruit and other perishable crops, the expansion of the dairy industry, and the increase in irrigated fodder production were proved to be contingent upon adequate road facilities, so that perishable produce could be marketed without delay and in good condition. Such systems of agriculture are known to be much more profitable to the farmer than the cultivation of ordinary main crops and their extension over wider areas would naturally result in greater financial prosperity to the tract in which such extension takes place. A third and very important factor is the actual saving to the community in the costs of transport, because in moving material, whether by lorry or by bullock cart, there is a definite



LESS TIME + LESS WEAR + BIGGER LOADS WITH LESS EFFORT

saving to the lorry or cart owner if the transport is over good roads instead of *kutchra* roads or tracks. In the case of lorries, it is easy to work out the actual saving in money and, though the saving by carts is not so obvious, there actually is a saving which can be

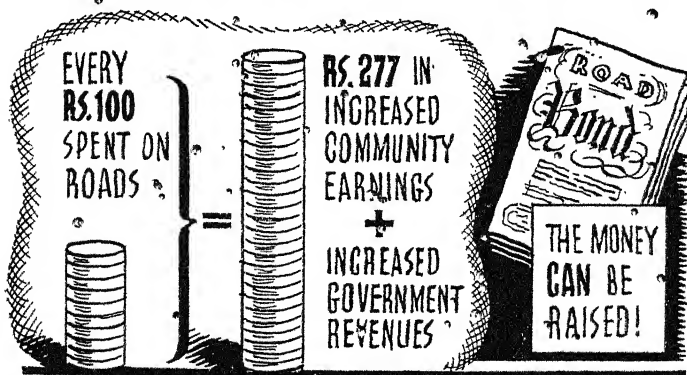
translated into money value. On good roads, the carts can carry heavier loads and thus the number of carts required will be less, with the result that less bullocks are used and the balance remains available for village uses. On good roads there is less wear and tear on the cart and less exertion is required on the part of the bullocks. Further, on good roads, there is considerable saving of time as compared with the *kutchra* roads, which also leaves more bullocks available for village work.

Working on the above lines, the Report shows that the financial benefits to the community through road development in the areas concerned amounts roughly to Rs. 11.97 lacs per year whereas the roads, required, including satisfactory maintenance for twenty years, will cost no more than 4.32 lacs annually, assuming that a loan is raised for the initial cost, redeemable at $3\frac{1}{2}\%$ interest in twenty years. Thus, for every Rs. 100/- spent on roads, the annual return through increased earnings to the community amounts to Rs. 277/-. This is apart from the inevitable rise in the revenues to Government through the increased use of road transport, the taxation of which, even at present, yields a revenue approximately double the total road expenditure in the country. Some of the further advantages from road development are increased traffic for railways and the mental, moral and physical advancement of the population resulting from the opening up of the villages. In the wake of roads will follow the development of health services, the extension of educational facilities, the opening of schools, better interchange of information through an improved postal system and extension of travelling cinemas, libraries and dispensaries to the villages. Roads also help the fuller utilization of forest produce so that Nature's fertilizers, now used for fuel, can be saved for agricultural purposes, apart from the fact that increased

national production and consumption foster an improvement in the standard of living.

Roads very definitely pay for themselves. The benefits that accrue as a result of good roads go, as a rule, to the whole community, whereas the party who paid for the roads namely government, gets its money back only by taxation and other indirect means. Many methods of obtaining direct returns from roads and bridges have been tried—and in certain cases with success—as it has been found from experience that people do not mind paying for facilities, provided they have them in front of their eyes, but they do strongly object to paying tolls when all they can see is the bad road along which they have to struggle. If they can see a first class road or a bridge that will save time and discomfort, they will not object to paying for the use of these amenities and it is quite possible that in future some system of coupons or season tickets will be issued over certain stretches of road which can be paid for without undue annoyance to the public.

During the early part of this century, enormous sums of money were raised in America through Bonds which were backed by the country as a whole. These



bonds are the same as loans, with this difference that the whole amount is not raised all at once, but in annual instalments over five to six years or more, according to the capital requirements which have to be met each year. The road programme extends over a period of years and will not therefore require in the first year the expenditure of the total cost involved. Similarly, it is possible to retire the bonds over a period of years where such a step is favoured, earmarking for the purpose the annual yield from any specific tax or source of revenue, in preference to creating a Sinking Fund and paying off all the bonds simultaneously at the end of the fixed number of years.

In Hyderabad and other progressive Indian States, there is very definite co-operation between roads and railways, and rail-cum-road tickets are issued at the beginning of the journey.

Railways have a very close interest in roads when these roads act as feeders, as they bring trade to and take goods and people away from their stations. There has been much controversy and acrimonious discussion on this question of road *versus* rail, but people are beginning to see that the two means of transport are complementary to each other, and that while healthy rivalry usually makes for efficiency, unfair cut-throat competition must be put down with a firm hand.

In the United Kingdom, many millions of pounds of railway money are invested in roads, and in most cases, road and railway services run in double harness with satisfaction to both sides and to the public. Let us hope that such co-operation will become general in India in the next few years.

CHAPTER IX.

WHERE IS THE MONEY TO COME FROM ?

Most of us have by now probably realized that the community as a whole benefits from good communications, and roads obviously form a major branch of communications. It is an accepted fact that "the community pays for good roads whether it has them or not, but it pays more if it has not got them." This slogan originated many years ago in America and its truth has actually been brought home to people in India today. To those who are still doubtful of its meaning or its truth, it may be explained that the essential transport of goods costs a vast amount of money anyhow, but it costs very much less if the means of communication are efficient. It is fairly obvious, therefore, that to save money on communications, we must improve them.

It is an accepted fact that not only do better communications bring about cultural and social contacts, but they undoubtedly effect a direct increase in the general national wealth and, in addition, a considerable increase in the general revenues is bound to occur. A portion of this extra revenue should, in fairness, be used to swell the funds for the construction and maintenance of roads.

You may ask how the general revenues are benefitted by these means. Let us assume for a moment that India is covered with first-class roads. What will this mean? It will mean a vast increase in the number of buses, motor cars and motor lorries driving along the roads. Most of these vehicles will have to be imported, anyway

for the next five years or so, and they will all pay customs duties. They will all burn petrol, and we know the enormous tax petrol pays to the Central Revenues. They will all use pneumatic tyres. The import of these will bring more revenue to the State, and the manufacture of tyres in India will directly help industry, which again pays taxes to Government. The same can be said about spare parts, of which there will be millions.

Another aspect is what is known abroad as 'tourism,' meaning the use of all kinds of communications for the purpose of sight-seeing and getting to know the interesting land-marks and natural archaeological features of the countryside. India is rich in ancient monuments. We have the Ajanta and the Ellora caves, magnificent tombs of ancient heroes, at Fatehpur-Sikri the old palaces of the Great Akbar, and the Rock Temples of South India. All these things mean money from the tourists, enrichment of the local inhabitants, and the increasing wealth of the population means financial prosperity for the Government of the day.

The rapid advance in aeroplane designs developed during the war will bring to this country people who have never been able to afford the time or money hitherto necessary. The papers speak of the days when great aeroplanes will carry 200 people from the United Kingdom to India in a couple of days. Already these machines are taking people across the Atlantic with as much ease as in flying from London to Paris. The world is shrinking rapidly in size and, whereas ten years ago it took a fortnight to get to Australia and three weeks to England, these trips can now be done in almost as many hours as it used to take days. Surely this points to a peaceful invasion of this country by tens of thousands of people who, having read about India, will want to

BETTER ROADS BRING MORE WEALTH TO THE NATION, BESIDES IMPROVEMENT IN SOCIAL AND CULTURAL CONDITIONS.



see it for themselves. Most of these people will come with money in their pockets and a careful nursing of visitors by good internal communications and good hotel facilities for sight-seeing will help to bring more and more of them.

Just as the wealth of India has so far been only scratched, the possibilities of travel and tourism have been to all intents and purposes a closed book. Open up the wonders and natural beauty of this country to the peoples of the world, and they will bring with them new ideas—in addition to hard cash. The archaeological and architectural sciences will be vastly assisted by this influx from the outside world. From the natural beauties of the snow-clad Himalayas to the cocoanut palm groves of Southern India, Nature is lavish in her grandeur and beauty, and, while her gifts in their abundance are free for all, there is no reason why we should not do as the Swiss have done so successfully—make a reasonable income from the visitors who wish to share with us this natural beauty.

You cannot however expect visitors straight from New York and the great capitals of Europe to be content with the transport arrangements of the last century. Neither can you expect people to come from great hotels full of modern conveniences and luxuries and be content with the Dak-bungalows or Rest Houses of India, where the usual menu consists of a badly cooked and somewhat ancient *mufghi*! With better roads, however, and the tourists they will attract, we may expect enterprising hotel keepers and industrial companies to realize the possibilities of this development and soon we shall see modern hotels and road facilities such as are common in America springing up everywhere. Hotels with every comfort situated



Here is a chance then for enterprising men and women to show that they are in earnest when they plead for the betterment of the land of their birth. Wealth creates wealth. The coming of new ideas will very soon affect the people in the loneliest out-posts. New methods of agriculture and farming, new methods of fruit growing, rapid transport of fragile commodities, a balanced diet for the people—all these things will help to make a happier country and, with increasing trade, money will very soon be found for direct expenditure on more and more communications, for the financing of loans for roads, and the thousand amenities which will become necessary in their wake.

What is required is faith in the future.

CHAPTER X.

WANTED AN ALL-INDIA TRANSPORT BOARD.

Much has been written and many meetings have been held all over the country in connection with road-rail co-ordination. This is a highly complex subject and it is not proposed to deal with it at all fully in this booklet but it is as well to bear in mind certain elementary principles. These were very clearly set out recently by Sir Kenneth Mitchell, Chief Controller of Road Transport and Development :—

“ Every one now looks to see the whole economic potential of this country harnessed to social and material progress.

If we waste our money and effort by avoidable duplication of means of transport we shall certainly retard progress.”

There is, and always must be, within a foreseeable future, room both for roads and railways and the protagonists of both these means of transport must learn to work in harmony for the good of the country. To this end, a certain amount of control is absolutely unavoidable and, however democratic and independent we may be in our ideas, we must submit to this partial control for the benefit of all. But co-ordination of transport should not be taken to mean the prevention of competition between roads and railways. Competition which is of a healthy character should be encouraged, as otherwise both roads and railways will tend to stagnate by losing the incentive for improving their services

to the public. This principle is followed both in England and America and has been the main reason for the high efficiency of their transport services.

In England, some £10 million of railway money is invested in Bus Companies and while they vie with each other in trying to serve the passenger and help the customer in the transport of goods, they avoid, in most instances, cutting each other's throats by unrestricted competition. There is not the slightest doubt that certain heavy goods, such as coal and certain building materials must be carried by the Railways to get economic results and, except where the road can render a superior service, such as within distances which can easily be covered in a normal working day, it is unreasonable to expect the railways (which in India are run on the tax payers' money) to put up with any substantial annexation by uncontrolled Road Companies of the cream of the traffic on which they must rely so as to balance their rate structure and to compensate for the low rate of freight on heavy and long distance articles.

Economically speaking, roads should feed the railways, while at the same time maintaining their independent life for the countless users of the "King's Highway." This expression is synonymous with the freedom of the road, but you cannot have freedom without paying for it. Every one is allowed to use the highway as he or she likes, without any direct payment for the advantages of being able to do so. Engineers talk of "segregation," by which they mean splitting up the road into various lines of traffic for pedestrians, cyclists, bullock carts, and fast-moving cars and lorries. Segregation, however, while proving a success where traffic can be regulated, necessitates wide roads and would be difficult to enforce over the vast distances of country roads throughout India, though it is hoped that our planners will allow

room for such segregation wherever it can be arranged. In the meantime, on urban and suburban roads, segregation is proving of the utmost value and should be encouraged in every possible way by Municipalities and all concerned. The accompanying tables give some idea of the situation in 1939 as regards road mileage, main types of construction and the authorities responsible, etc.

Road Mileage in British India and Indian States on 31-3-1938

	Miles		Miles
Modern Surfaces	9,650	} Total :	85,792
Waterbound Macadam	76,142		
Low type motorable Gravel, Murrum, etc.	29,473	} Total unmetalled	2,61,340
Natural soil—			
Fairweather roads	1,22,736		
Cart tracks, bridle paths, etc.	1,09,131		
Grand Total :			3,47,132

Note :—Of the unmetalled miles a large proportion, particularly in Bengal and Bihar, is not maintained, and they cannot really be termed "roads." In addition to the above, there are 18,433 miles of municipal roads in British India.

Types of Road Mileages and Agencies Responsible for
Construction and Maintenance.

	P.W.D.	Local Board	Indian States	Total
Modern Surfaces	7,058	2,045	1,547	9,650
Metalled Roads	17,514	37,453	21,145	76,142
Unmetalled Roads	15,901	2,05,342	40,097	2,61,340
	40,473	2,44,840	61,819	3,47,132

Between the P.W.D., District Boards and Municipalities, the amount of control differs from Province to Province. The Government of India have undertaken, under a promise of co-operation from the Provinces in the matter of control of road transport, to construct and maintain a large portion of the great system of roads known as National Highways, described in the Chief Engineers' Report. Most of the Indian States control their

own road systems though they try to connect as far as possible with the roads of British India.

To co-ordinate all these authorities, it is the considered opinion of those who have studied the matter that there must be some central authority such as an All-India Transport Board to see to the development of railways, roads, river transport, coastal traffic, and possibly air-lines.

In the meantime, the Central Government are examining the possibility of entrusting to a Road Board the co-ordination of the five-year plans of road development prepared by Provincial Governments, the disposal of technical questions, the initiation and direction of schemes for road research, and preliminary discussions with the Railway Board of road and rail development plans and with the Provincial Governments of proposed amendments to the Motor Vehicles Act and Rules.

There is another potential source of road building which has so far been very little tapped and that is the people themselves. There is no doubt that if sufficient knowledge and enthusiasm can be imparted to our crores of villagers concerning the advantages of easy communication with arterial roads, railways and neighbouring villages, there will be an enormous drive towards the insistence on better rural roads. It is definitely to the advantage of the people to build these roads themselves and to join them up with the main system. The building of small village roads is not so expensive or difficult as many believe and if the desire to co-operate is there, the actual work can be done without the expenditure of much more than a certain amount of local labour during those parts of the year when the claims of agriculture allow it.

CHAPTER XI.

HOW WE CAN ALL HELP

Without faith in the future of India, no one can pull his weight in bringing to pass the rosy dreams of the planners of today. Expert engineers and experts in all walks of life, economists, agriculturists, machine specialists can and do make plans. But these plans will stay on paper as blue prints, unless a united effort converts them into actuality and every one of us can and must help in this effort by which the half-starving and ill-clad millions may be enabled to take their place in a community where all are free to work for a better and fuller life. With faith and enthusiasm, there is nothing to stop a vast improvement in the life of these people. It cannot be left to Governments, to Boards, to Municipalities. The drive must come from the bottom upwards.

How can this enthusiasm and will to work be generated? The experience of other countries has proved that the education of the masses along sound and practical lines is the shortest way to the enrichment of a country. Only about twentyfive years ago, great tracts of America were comparable to a large part of India today. There were millions of poorly educated peasants and farmers who were eking out a bare subsistence from lands which were deteriorating for want of knowledge and proper methods of agriculture. Erosion, that curse of the modern world, was spreading apace as it is in India today. The top soil, which is the life-blood of farming was being washed away by successive rains into the surrounding oceans. Once lost, this top soil, which is so vital to agriculture, takes some

five hundred years to be replaced. It is more valuable than gold and diamonds and yet, before our very eyes, hundreds of square miles are being washed away every year. Here again, knowledge by the people of what is going on is the only way to stop this waste. On the one hand, the population of the country is increasing at the rate of over five millions a year while, on the other, the means of feeding people are being literally washed out to sea. Erosion can and must be stopped. Fortunately, Provincial and State Governments and the Central Government are beginning to realize the seriousness of this problem and are taking steps by better agriculture, contour bunding and afforestation to stop the rot.

Not much more than twentyfive years ago, better roads were the means of spreading education in America. Travelling schools and libraries were enabled to approach areas which before had been inaccessible. The interchange of ideas, travelling cinemas, travelling salesmen, all did their work. There is practically no part of America today which is outside the network of easy communications. Through the spread of ideas, great schemes which have been revolutionising vast tracts of country as in the Tennessee Valley have brought new life to millions of Americans, and where there was despondency, malnutrition, poverty and ill-health, there are now flourishing towns and villages and abundance of food for all.

You may ask : "What can I do personally to help on such good work?"

Firstly, you can acquaint yourself with the true facts concerning road transport in this country. Having made up your mind that better roads are necessary, use your influence, great or small as the case may be, in passing your knowledge on to others. Help to make

people realise that everyone should be interested in having better roads as without them it will be far more difficult to put into practice the many plans for the betterment of the country. In this way you can help build up a strong public opinion without which it is difficult for any Government to move.

If you live in the country, think out plans by which life in your village could be made happier, if only you had easier contact with the outside world, and throw yourself wholeheartedly into any scheme for the betterment of the lanes and pathways in your immediate neighbourhood.

So by our united efforts to make "Roads for India" something more than a slogan, we may hope to see the dawn of a new era when through better communications new opportunities for happiness and prosperity can be brought to the people of this great country.

